

The global context of nuclear industry in Mongolia

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Mongolia has a new and growing uranium industry and a strong commitment to a nuclear-weapons free world. Mongolia wishes to develop its natural uranium resources as part of its economic and technological progress. At the same time, it wants to raise the standard of living of its citizens while making a substantial contribution to a vibrant, safe and secure global nuclear future.

The attitudes about the peaceful use of

nuclear energy are changing world-wide. After the horrors of the Chernobyl accident in 1986, the world saw a dramatic cut in plans for new nuclear power plants. In some countries, antinuclear movements stopped almost all construction. However, concern about climate change and the increasing demand for electricity in industrialized and developing countries alike is motivating a new look at nuclear energy. Nuclear power plants do not emit harmful carbon dioxide; therefore, they are seen as an important way to generate carbon free power. More importantly for countries like Mongolia, an abundant, steady supply of clean electricity generated by a nuclear plant would enable citizens to

heat their homes and cook without using dirty coal or wood. This would help solve pollution problems (like in Ulaanbaatar) and allow citizens to breathe clean air. Around the world, nuclear companies are preparing for future business. Toshiba and Mitsubishi of Japan, Areva of France, General Electric of USA, RosAtom of Russia and others are planning to build reactors in China, India, USA, and Europe, and elsewhere. Other countries are studying the possibility of constructing their first nuclear power reactor.

However, expanding nuclear power, is not without risk. Most nuclear reactors use a nuclear fuel made of enriched uranium. Before the fuel can be "burned," the uranium must be mined, milled enriched and fabricated into a form suitable for a commercial nuclear reactor. In the enrichment process, the abundance of the isotope U-235 is increased relative to the more common isotope U-238. Typically, nuclear reactors need only slightly enriched fuel (3-5 percent). However, enrichment technology is seen as a needle with two ends: it can be used to make peaceful nuclear fuel, but, it can also be used to make highly enriched, weapons grade uranium (>20%). To limit the spread of enrichment technology, and thus mitigate the nuclear weapons proliferation risk, the International Atomic Energy Agency has proposed a multinational approach to fuel enrichment.

Internationalization of the nuclear fuel cycle could be a game changer that allows for the growth of nuclear power while reducing the spread of nuclear weapons. All emerging nuclear nations inevitably will need plans for the "back-end" of the fuel cycle; namely the management and ultimate disposal of the spent fuel and radioactive waste. If a nuclear power is to expand, the necessary condition for such growth will be a solution to deal properly with existing and expected waste. Two examples demonstrate the difficulty of the issue. In the US, the Yucca Mountain Spent Fuel Repository in Nevada, after years of debate and controversy, was halted in 2008. Political disagreements generated substantial delay and eventually lead to the cancelation of the project. Another example is that Japan has a substantial



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amount of nuclear waste but no site for permanent storage. Without solving the waste problem, nuclear industry growth is questionable. One possible solution is to reprocess the waste for future use as fuel. On one hand, this approach is obviously promising because it enables greater use of a fixed amount of uranium fuel; on the other hand, reprocessing is troubling because it generates large amounts of plutonium that could be used for weapons. Mongolia and other new nuclear countries should look at cases in advanced nuclear countries; start at least, the considerations for the proper management of eventual and inevitable nuclear spent-fuel.

Regional and multilateral approaches could provide successful assurance of fresh fuel, waste management services and other key elements of the fuel cycle. The multilateral approaches to both the front-end and back-end of nuclear fuel cycle are seen as the linchpin to the sensible prevention of proliferation. There are thus exciting prospects for multinational efforts to deal with these key issues in collaborative ways that are advantageous for all nations.

Mongolia is in a unique position to help further these world-wide and regional goals. It is one of the few countries with abundant, economically accessible ura-

nium reserves. It is also a growing democracy in a vital region of the world with expanding nuclear energy interests. In Northeast Asia, Russia has excess nuclear industry capacity; Japan and South Korea have expanding nuclear power fleets and demand for raw material; and China has the most rapidly growing nuclear industry. Furthermore, Mongolia is a neutral country with a strong commitment to a nuclear-weapons free world.

Mongolia should thus explore the concept of multilateral initiatives with key nuclear partners that can result in a new and markedly improved framework for the future of nuclear power in Northeast Asia and world-wide. Multinational and international participation will be designed to serve the energy supply, security, and nonproliferation needs of the region. Mongolia may seek to offer its resources in an unprecedented way that maximizes transparency and long term stability. Such regional and world-wide cooperation would be a game changer, a pragmatic solution to many of the most important issues of our time in a manner that improves people's standard of living and reduces security and environmental concerns at the same time.

Born in 1973, in a coal-mining town Nal-aikh, east of Ulaanbaatar, Undraa Agvaanluvsan, is a visiting professor at one of the world's most prestigious universities, Stanford University in California, USA. Undraa excelled in her studies at the National University of Mongolia while earning bachelors and masters degrees in physics. In 1996, she went to study high energy physics at International Centre for Theoretical Physics in Italy and continued on to US to do her doctorate at North Carolina State University. After completing an award-winning dissertation work in statistical nuclear physics and quantum chaos, Dr. Undraa conducted postdoctoral research at Lawrence Livermore National Laboratory in California. Currently at Stanford University, Dr. Undraa has conducted research in nuclear energy policy and is teaching on the contemporary issues in nuclear energy. She was a founding director, is now a member of the board, of the MonAme Scientific Research Center in Ulaanbaatar. After her work at Stanford, Dr. Undraa is returning to Mongolia as a Deputy Director of the prestigious Institute of Strategic Studies at the National Security Council of Mongolia.

